

WHAT IS CLAIMED IS:

1. A peer-to-peer network environment, comprising:

5 a plurality of peer groups, wherein each peer group comprises a plurality of peer group members, and wherein each peer group member comprises a network node configured to communicate with other members of its peer group over one or more networks;

10 wherein each peer group defines a common set of services available to members of that peer group; and

15 wherein a plurality of members of one of said plurality of peer groups are configured to share a network service or content with other members of said peer group only, so that said peer group defines a limited domain of availability for said network service or said content.

20 2. The peer-to-peer network environment as recited in claim 1, wherein said common set of services comprises a membership service, wherein said membership service implements a membership protocol for joining a peer group such that any peer in the peer-to-peer network environment may apply for membership in the peer group in accordance with the membership protocol.

25 3. The peer-to-peer network environment as recited in claim 2, wherein one or more members of said peer group are configured to provide said membership service for said peer group, wherein said membership service for said peer group implements a membership policy for said peer group restricting which peers in the peer-to-peer network environment are allowed to join said peer group.

4. The peer-to-peer network environment as recited in claim 3, wherein said membership service for said peer group is configured to:

receive an apply message from a potential new peer group member, wherein said
5 apply message is formatted as defined by said membership protocol;

respond to said apply message with a first acknowledge message formatted as
defined by said membership protocol, wherein if the potential new peer
group member is qualified to apply in accordance with the membership
10 policy for said peer group, the first acknowledge message comprises an
application credential;

receive a join message including the application credential from the potential new
peer group member, wherein said join message is formatted as defined by
15 said membership protocol; and

respond to said join message with a second acknowledge message formatted as
defined by said membership protocol, wherein if the potential new peer
group member is qualified to join in accordance with the membership
20 policy for said peer group, the second acknowledge message comprises a
membership credential and a peer group advertisement for said peer group
describing the common set of services available to members of said peer
group.

25 5. The peer-to-peer network environment as recited in claim 4, wherein said
membership credential identifies a peer as a member of said peer group.

6. The peer-to-peer network environment as recited in claim 4, wherein a
plurality of members of said peer group are configured to provide an advertisement for
30 applying to said peer group, wherein said advertisement for applying to said peer group

comprises a description of said peer group, requirements for joining said peer group, and an endpoint within the peer-to-peer network environment indicating where to send said apply message.

5 7. The peer-to-peer network environment as recited in claim 6, wherein said advertisement for applying to said peer group is discoverable within the peer-to-peer network environment in accordance with a discovery protocol.

10 8. The peer-to-peer network environment as recited in claim 1, wherein said peer group defines an implicit scope for all peer group messages originating within said peer group, so that a peer group message sent by one of the members of said peer group is sent to the members of said peer group but not outside said peer group.

15 9. The peer-to-peer network environment as recited in claim 8, wherein one or more peers within said peer group are configured to receive a peer group message from other members of said peer group, wherein said peer group message comprises a query message for content within said peer group.

20 10. The peer-to-peer network environment as recited in claim 9, wherein said query message is formatted in accordance with a resolver protocol implemented as one of said common set of services for said peer group, wherein said resolver protocol defines query and response message formats.

25 11. The peer-to-peer network environment as recited in claim 1, wherein said common set of services for said peer group include a peer monitoring service configured to implement a peer information protocol, wherein said peer information protocol defines a message format for requesting and responding to requests regarding peer activity so that said peer groups defines a monitorable domain within the peer-to-peer network environment.

30

12. The peer-to-peer network environment as recited in claim 1, wherein a plurality of peer groups members of said peer group are configured to provide redundant instances of said network service or content to said peer group, wherein a member of said peer group can access said network service or content from any of said plurality of peer groups members providing one of the redundant instances of said network service or content.

13. The peer-to-peer network environment as recited in claim 12, wherein said plurality of peer groups members providing redundant instances of said network service or content are configured to provide a fail-over mechanism wherein if one of the peers providing said network service or content fails or leaves said peer group, said network service or content may be obtained from another one of the peers providing said network service or content.

14. The peer-to-peer network environment as recited in claim 12, wherein said plurality of peer groups members providing redundant instances of said network service or content support a pipe binding protocol for establishing a communication pipe to access said network service or content, wherein a member of said peer group can access said network service or content by connecting to a pipe to one of the redundant instances of said network service or content.

15. The peer-to-peer network environment as recited in claim 14, wherein the plurality of peer groups members providing redundant instances of said network service or content are configured to rebind a communication pipe in accordance with the pipe binding protocol from a failed one of the plurality of peer groups members providing redundant instances of said network service or content to another one of the plurality of peer groups members providing redundant instances of said network service or content so that peer groups members connected to that communication pipe continue to have access to said network service or content.

30

16. The peer-to-peer network environment as recited in claim 1, wherein said plurality of peer groups comprises a nested peer group within said peer group, wherein all members of said nested peer group belong to said peer group, but not all members of said peer group belong to said nested peer group.

5

17. The peer-to-peer network environment as recited in claim 16, wherein said common set of services available to members of said nested peer group includes at least all of said common set of services available to members of said peer group.

10

18. The peer-to-peer network environment as recited in claim 16, wherein said network service or content shared within said peer group is also accessible within said nested peer group, wherein said nested peer group is configured to share an additional network service or content available only within said nested peer group and not to members of said peer group that do not also belong to said nested peer group.

15

19. The peer-to-peer network environment as recited in claim 1, wherein said common set of services available to members of said peer group implement protocols for joining and leaving said peer group and for sharing said network service or content within said peer group, wherein said protocols are platform independent as to programming language implementations and network transport for said common set of services.

20

20. A peer node, comprising:

a processor;

25

a network interface operable to couple the peer node to a network;

a memory operable to store program instructions, wherein the program instructions are executable by the processor to:

30

join a peer group in accordance with a membership protocol;

upon joining said peer group, instantiate one or more of a common set of
services defined for said peer group; and

5

share a network service or content with other members of said peer group
only, so that said peer group defines a limited domain of
availability for said network service or said content.

10 21. The peer node as recited in claim 20, wherein, in said joining a peer group,
the program instructions are further executable to:

send an apply message to said peer group, wherein said apply message is
formatted in accordance with the peer membership protocol;

15

receive a first acknowledge message formatted in accordance with the peer
membership protocol in response to the apply message, wherein the first
acknowledge message comprises an application credential;

20 send a join message including the application credential to said peer group,
wherein said join message is formatted in accordance with the peer
membership protocol; and

25 receive a second acknowledge message formatted in accordance with the peer
membership protocol in response to said join message, the second
acknowledge message comprises a membership credential and a peer
group advertisement for said peer group, wherein the peer group
advertisement includes information about the common set of services
available to members of said peer group.

30

22. The peer node as recited in claim 21, wherein said membership credential identifies the peer node as a member of said peer group.

23. The peer node as recited in claim 20, wherein the program instructions are
5 further executable to discover said peer group according to a discovery protocol.

24. The peer node as recited in claim 23, wherein, in said discovering, the program instructions are further executable to:

10 send a discovery query message including one or more criteria, wherein the discovery query message is formatted in accordance with the discovery protocol; and

receive a message in response to the discovery query message including one or
15 more advertisements fitting the one or more criteria, wherein each of said one or more advertisements includes a description a corresponding peer group, requirements for joining the corresponding peer group, and an endpoint advertisement indicating where to send a message to apply for membership in the corresponding peer group, wherein the response
20 message is formatted in accordance with the discovery protocol.

25. The peer node as recited in claim 20, wherein the program instructions are further executable to instantiate a discovery service for said peer group in accordance with a discovery protocol.

25

26. The peer node as recited in claim 25, wherein the discovery service is operable to:

receive a discovery query message including one or more criteria, wherein the
30 discovery query message is formatted in accordance with the discovery

protocol; and

send a message in response to the discovery query message including one or more advertisements fitting the one or more criteria, wherein each of said one or more advertisements includes a description a corresponding peer group, requirements for joining the corresponding peer group, and an endpoint advertisement indicating where to send a message to apply for membership in the corresponding peer group, wherein the response message is formatted in accordance with the discovery protocol.

27. The peer node as recited in claim 20, wherein the program instructions are further executable to:

join another peer group in accordance with the membership protocol;

upon joining said other peer group, instantiate one or more of a common set of services defined for said other peer group; and

share a network service or content with other members of said other peer group only, so that said other peer group defines a limited domain of availability within said other peer group for the network service or content.

28. The peer node as recited in claim 20, wherein said common set of services comprises a membership service, wherein said membership service implements the membership protocol for joining said peer group such that any peer node may apply for membership in said peer group in accordance with the membership protocol.

29. The peer node as recited in claim 28, wherein said membership service implements a membership policy for said peer group restricting which peers are allowed to join said peer group.

30. The peer node as recited in claim 29, wherein said membership service is operable to:

5 receive an apply message from a potential new peer group member, wherein said apply message is formatted as defined by said membership protocol;

respond to said apply message with a first acknowledge message formatted as defined by said membership protocol, wherein if the potential new peer group member is qualified to apply in accordance with the membership policy for said peer group, the first acknowledge message comprises an application credential;

10 receive a join message including the application credential from the potential new peer group member, wherein said join message is formatted as defined by said membership protocol; and

respond to said join message with a second acknowledge message formatted as defined by said membership protocol, wherein if the potential new peer group member is qualified to join in accordance with the membership policy for said peer group, the second acknowledge message comprises a membership credential identifying the peer node as a peer group member and a peer group advertisement for said peer group describing the common set of services available to member peers of said peer group.

25 31. The peer node as recited in claim 20, wherein the program instructions are further executable to, upon joining said peer group, provide a peer group advertisement for said peer group, wherein said peer group advertisement comprises:

30 a description of said peer group;

membership requirements for said peer group; and

one or more pipe endpoint advertisements for receiving membership protocol
5 messages from potential peer group members.

32. The peer node as recited in claim 20, wherein the program instructions are
further executable to:

10 send a query message requesting content within said peer group, wherein said
query message is formatted in accordance with a resolver protocol; and

receive a response message to said query message from within said peer group,
wherein said response message includes the requested content, wherein
15 said response message is formatted in accordance with the resolver
protocol.

33. The peer node as recited in claim 20, wherein the program instructions are
further executable by the processor to:

20 receive a query message requesting content from within said peer group, wherein
said query message is formatted in accordance with a resolver protocol;
and

25 send a response message to said query message within said peer group, wherein
said response message includes the requested content if said peer node has
access to the requested content, wherein said response message is
formatted in accordance with the resolver protocol.

34. The peer node as recited in claim 20, wherein instances of said shared network services or content are provided by two or more members of said peer group.

35. The peer node as recited in claim 20, wherein the program instructions are further executable to bind to a communication pipe to access an instance of a network service hosted by another peer node in the peer group in accordance with a pipe binding protocol.

36. The peer node as recited in claim 35, wherein, if the instance of the network service that the peer node is bound to becomes unavailable, the program instructions are further executable to rebind said communication pipe from the instance of the network service to a redundant instance of the network service hosted on another peer node.

37. The peer node as recited in claim 35, wherein, if the peer node is moved from a first physical location to a second physical location, the program instructions are further executable to rebind said communication pipe from an endpoint located at the first network location to the second network location.

38. The peer node as recited in claim 20, wherein said common set of services implement a protocol for joining and leaving said peer group, wherein said protocol is platform independent as to programming language implementations and network transport for said common set of services.

39. A peer node, comprising:

a processor;

a network interface operable to couple the peer node to a network;

a memory operable to store program instructions, wherein the program instructions are executable by the processor to:

create an advertisement for a peer group in accordance with a protocol,
wherein said advertisement for the peer group comprises:

an identifier for the peer group;

a description of a common set of services to be instantiated within
the peer group by members of the peer group; and

a membership service advertisement indicating how others peers
may request to join the peer group; and

publish at least a portion of said advertisement for the peer group
including said identifier and said membership service
advertisement.

40. The peer node as recited in claim 39, wherein said advertisement for the peer
group further comprises a name associated with the peer group.

41. The peer node as recited in claim 40, wherein said name associated with the
peer group is obtained from a centralized naming service coupled to the network, so that
said name associated with the peer group is unique within the network.

42. The peer node as recited in claim 39, wherein said advertisement for the peer
group further comprises keywords for use in indexing and discovering the peer group.

43. The peer node as recited in claim 39, wherein said advertisement for the peer group further comprises a description of an initial service to be instantiated by other peer nodes when joining the peer group.

5 44. The peer node as recited in claim 39, wherein said program instructions are further executable to instantiate a membership service, wherein said membership service implements a membership protocol for joining said peer group such that any peer node may apply for membership in said peer group in accordance with the membership protocol.

10 45. The peer node as recited in claim 44, wherein said membership service implements a membership policy for said peer group restricting which peers are allowed to join said peer group.

15 46. The peer node as recited in claim 44, wherein said membership service is operable to:

 receive an apply message from a potential new peer group member, wherein said apply message is formatted as defined by said membership protocol;

20 respond to said apply message with a first acknowledge message formatted as defined by said membership protocol, wherein if the potential new peer group member is qualified to apply in accordance with the membership policy for said peer group, the first acknowledge message comprises an application credential;

25 receive a join message including the application credential from the potential new peer group member, wherein said join message is formatted as defined by said membership protocol; and

respond to said join message with a second acknowledge message formatted as defined by said membership protocol, wherein if the potential new peer group member is qualified to join in accordance with the membership policy for said peer group, the second acknowledge message comprises a membership credential identifying the peer node as a peer group member and a peer group advertisement for said peer group describing the common set of services available to member peers of said peer group.

47. The peer node as recited in claim 39, wherein the program instructions are further executable to:

receive a discovery query message including one or more criteria, wherein the discovery query message is formatted in accordance with the discovery protocol; and

send a message in response to the discovery query message including one or more advertisements fitting the one or more criteria, wherein each of said one or more advertisements includes a description a corresponding peer group, requirements for joining the corresponding peer group, and an endpoint advertisement indicating where to send a message to apply for membership in the corresponding peer group, wherein the response message is formatted in accordance with the discovery protocol.

48. The peer node as recited in claim 39, wherein said common set of services are shared with other members of said peer group only, so that said peer group defines a limited domain of availability for said services.

49. The peer node as recited in claim 39, wherein said common set of services implements a protocol for joining and leaving said peer group, wherein said protocol is

platform independent as to programming language implementations and network transport for said common set of services.

50. A peer computing system, comprising:

5

a plurality of peer nodes;

10

a subset of said plurality of peer nodes configured to participate in a peer discovery protocol to discover other peer nodes and discover one or more peer groups, wherein said discovering one or more peer groups comprises discovering one or more peer group advertisements for the peer groups;

15

a subset of said plurality of peer nodes configured to participate in a peer membership protocol for joining said discovered peer groups; and

20

wherein each of the one or more peer groups comprises a common set of services shared by member peer nodes of the particular peer group only, so that the particular peer group defines a limited domain of availability for said services.

25

51. The peer computing system as recited in claim 50, wherein one or more of the subset of peer nodes configured to participate in the peer membership protocol are included in the subset of peer nodes configured to participate in the peer discovery protocol.

52. The peer computing system as recited in claim 50, wherein each peer group advertisement comprises:

30

an identifier for the particular peer group;

a description of a common set of services to be instantiated within the particular peer group by members of the particular peer group;

a membership service advertisement indicating how others peers may request to join the particular peer group; and

a name associated with the particular peer group.

53. The peer computing system as recited in claim 52, wherein said name associated with each peer group is obtained from a centralized naming service, so that each name is unique within the peer computing system.

54. The peer computing system as recited in claim 52, wherein the advertisement further comprises keywords that can be used to index and search for the particular peer group.

55. The peer computing system as recited in claim 52, wherein said advertisement for each peer group further comprises a description of an initial service to be instantiated by a peer node when joining the particular peer group.

56. The peer computing system as recited in claim 50, wherein each peer group implements a peer membership service that implements a membership policy for the particular peer group restricting which peer nodes are allowed to join the particular peer group.

57. The peer computing system as recited in claim 56, wherein one or more of the membership services are each operable to:

receive an apply message from a potential new peer group member, wherein said apply message is formatted as defined by said membership protocol;

respond to said apply message with a first acknowledge message formatted as defined by said membership protocol, wherein if the potential new peer group member is qualified to apply in accordance with the membership policy for the particular peer group, the first acknowledge message comprises an application credential;

receive a join message including the application credential from the potential new peer group member, wherein said join message is formatted as defined by said membership protocol; and

respond to said join message with a second acknowledge message formatted as defined by said membership protocol, wherein if the potential new peer group member is qualified to join in accordance with the membership policy for the particular peer group, the second acknowledge message comprises a membership credential identifying the peer as a member of the particular peer group and a peer group advertisement for the particular peer group describing the common set of services available to member peers of the particular peer group.

58. The peer computing system as recited in claim 50, wherein said plurality of peer nodes configured to participate in the peer discovery protocol are each configured to:

receive a discovery query message requesting advertisements comprising descriptions of services offered by the particular peer node, wherein the discovery query message is formatted in accordance with said discovery protocol; and

send a message in response to the discovery query message comprising one or more advertisements comprising descriptions of one or more services

offered by the particular peer node, wherein the response message is formatted in accordance with said discovery protocol.

5 59. The peer computing system as recited in claim 50, wherein said plurality of peer nodes configured to participate in the peer discovery protocol are each configured to:

10 send a discovery query message requesting advertisements comprising descriptions of services offered by the particular peer node, wherein the discovery query message is formatted in accordance with said discovery protocol; and

15 receive a message in response to the discovery query message comprising one or more advertisements comprising descriptions of one or more services offered by the particular peer node, wherein the response message is formatted in accordance with said discovery protocol.

20 60. The peer computing system as recited in claim 50, wherein the common set of services of each peer group implements a protocol for joining and leaving the particular peer group, wherein said protocol is platform independent as to programming language implementations and network transport for the particular common set of services.

61. A peer computing system, comprising:

25 a plurality of peer nodes;

means for a subset of said plurality of peer nodes to discover other peer nodes and discover one or more peer groups, wherein said discovering one or more peer groups comprises discovering one or more peer group advertisements for the peer groups;

30

means for the subset of said plurality of peer nodes to join said discovered peer groups; and

wherein each of the one or more peer groups comprises a common set of services shared by member peer nodes of the particular peer group only, so that the particular peer group defines a limited domain of availability for said services.

62. The peer computing system as recited in claim 61, wherein each peer group advertisement comprises:

an identifier for the particular peer group;

a description of a common set of services to be instantiated within the particular peer group by members of the particular peer group;

a membership service advertisement indicating how others peers may request to join the particular peer group; and

a name associated with the particular peer group.

63. The peer computing system as recited in claim 61, further comprising means for each peer group to implement a membership policy for the particular peer group restricting which peer nodes are allowed to join the particular peer group.

64. The peer computing system as recited in claim 63, further comprising means for each peer group to:

receive an apply message from a potential new peer group member;

respond to said apply message with a first acknowledge message, wherein if the potential new peer group member is qualified to apply in accordance with the membership policy for the particular peer group, the first acknowledge message comprises an application credential;

5

receive a join message including the application credential from the potential new peer group member; and

respond to said join message with a second acknowledge message, wherein if the potential new peer group member is qualified to join in accordance with the membership policy for the particular peer group, the second acknowledge message comprises a membership credential identifying the peer as a member of the particular peer group and a peer group advertisement for the particular peer group describing the common set of services available to member peers of the particular peer group.

10

15

65. The peer computing system as recited in claim 61, further comprising means for the subset of said plurality of peer nodes to:

receive a discovery query message requesting advertisements comprising descriptions of services offered by a peer node; and

20

25

send a message in response to the discovery query message comprising one or more advertisements comprising descriptions of one or more services offered by the peer node.

66. The peer computing system as recited in claim 61, further comprising means for the subset of said plurality of peer nodes to:

send a discovery query message requesting advertisements comprising

30

descriptions of services offered by a peer node; and

receive a message in response to the discovery query message comprising one or more advertisements comprising descriptions of one or more services offered by the peer node.

67. The peer computing system as recited in claim 61, further comprising means for each peer group to allow the peer nodes to join and leave the particular peer group.

68. The peer computing system as recited in claim 61, further comprising means for each of the subset of said plurality of peer nodes to:

receive a query message requesting content from within a particular peer group of which the particular peer node is a member peer; and

send a response message to said query message within the particular peer group, wherein said response message includes the requested content if the particular peer node has access to the requested content.

69. The peer computing system as recited in claim 61, further comprising means for providing redundant instances of said common set of services within a particular peer group.

70. A method comprising:

forming a plurality of peer groups in a peer-to-peer network, wherein each peer group comprises a plurality of peers;

each peer group defining a common set of services available to member peers of the particular peer group; and

wherein member peers of each peer group share network services or content with other member peers of the particular peer group only, so that the particular peer group defines a limited domain of availability for said network services or said content.

71. The method as recited in claim 70, wherein the common set of services comprises a membership service, wherein said membership service implements a membership protocol for joining the particular peer group such that any peer in the peer-to-peer network environment may apply for membership in the particular peer group in accordance with the membership protocol.

72. The method as recited in claim 70, wherein said membership service for each peer group implements a membership policy restricting which peers in the peer-to-peer network environment are allowed to join the particular peer group.

73. The method as recited in claim 70, further comprising:

a member peer of a particular one of the plurality of peer groups receiving an apply message from a potential new peer group member, wherein said apply message is formatted as defined by a membership protocol;

if the potential new peer group member is qualified to apply in accordance with a membership policy for the particular peer group, the member peer responding to said apply message with a first acknowledge message formatted as defined by said membership protocol, wherein the first acknowledge message comprises an application credential;

the member peer receiving a join message including the application credential from the potential new peer group member, wherein said join message is formatted as defined by said membership protocol; and

5 if the potential new peer group member is qualified to join in accordance with the membership policy for the particular peer group, the member peer responding to said join message with a second acknowledge message formatted as defined by said membership protocol, wherein the second acknowledge message comprises a membership credential identifying the
10 peer as a member of the particular peer group and a peer group advertisement for the particular peer group describing the common set of services available to members of the particular peer group.

74. The method as recited in claim 70, further comprising each peer group
15 providing an advertisement for applying to the particular peer group, wherein said advertisement for applying to the particular peer group comprises a description of the particular peer group, requirements for joining the particular peer group, and a pipe endpoint advertisement indicating where to send the apply message for applying to the particular peer group.

20 75. The method as recited in claim 70, further comprising each peer group defining an implicit scope for all peer group messages originating within the particular peer group, so that a peer group message sent by one of the members of the particular peer group is sent only to the members of the particular peer.

25 76. The method as recited in claim 70, further comprising:

a first member peer of a particular peer group receiving a peer group message from a second member peer of the particular peer group, wherein the peer

group message comprises a query message for content within the particular peer group; and

the first member peer providing the content requested in the query message to the second member peer.

77. The method as recited in claim 70, wherein the common set of services for a particular peer group includes a peer monitoring service that implements a peer information protocol, wherein said peer information protocol defines a message format for requesting and responding to requests regarding peer activity so that the particular peer group defines a monitorable domain within the peer-to-peer network environment.

78. The method as recited in claim 70, further comprising providing redundant instances of a network service within a particular peer group.

79. The method as recited in claim 78, further comprising a member peer of the particular peer group accessing one of the redundant instances of a network service, wherein, if the network service fails or a particular member peer hosting the instance of the network service leaves the particular peer group, said network service or content may be obtained from another one of the redundant instances of the network service.

80. A method comprising:

a peer node joining a peer group in accordance with a membership protocol;

upon joining said peer group, the peer node instantiating one or more of a common set of services defined for said peer group; and

the peer node sharing a network service or content with other members of said peer group only, so that said peer group defines a limited domain of availability for said network service or said content.

5 81. The method as recited in claim 80, wherein said joining comprises:

the peer node sending an apply message to the peer group, wherein said apply message is formatted as defined by said membership protocol;

10 the peer node receiving a first acknowledge message formatted as defined by said membership protocol in response to the apply message, wherein if said peer node is qualified to apply in accordance with the membership policy for the peer group, the first acknowledge message comprises an application credential;

15 the peer node sending a join message including the application credential to the peer group, wherein said join message is formatted as defined by said membership protocol; and

20 the peer node receiving a second acknowledge message formatted as defined by said membership protocol in response to said join message, wherein if said peer node is qualified to join in accordance with the membership policy for said peer group, the second acknowledge message comprises a membership credential identifying the peer node as a member of the peer group and a peer group advertisement for the peer group describing the
25 common set of services available to members of the peer group.

82. The method as recited in claim 80, further comprising, prior to said joining:

30 the peer node sending a discovery query message, wherein the discovery query

message is formatted in accordance with the discovery protocol; and

the peer node receiving a message in response to the discovery query message including one or more peer group advertisements each comprising a description of a particular peer group, requirements for joining the particular peer group, and a pipe endpoint advertisement indicating where to send a message to apply for membership in the particular peer group, wherein the response message is formatted in accordance with the discovery protocol.

83. The method as recited in claim 80, further comprising:

the peer node receiving a discovery query message, wherein the discovery query message is formatted in accordance with the discovery protocol; and

the peer node sending a message in response to the discovery query message including one or more peer group advertisements each comprising a description of a particular peer group, requirements for joining the particular peer group, and a pipe endpoint advertisement indicating where to send a message to apply for membership in the particular peer group, wherein the response message is formatted in accordance with the discovery protocol.

84. The method as recited in claim 80, further comprising:

the peer node sending a query message requesting content, wherein said query message is formatted in accordance with a resolver protocol; and

the peer node receiving a response message to said query message, wherein said response message includes the requested content.

85. The method as recited in claim 80, further comprising:

the peer node receiving a query message requesting content, wherein said query
5 message is formatted in accordance with a resolver protocol; and

the peer node sending a response to said query message, wherein said response
message includes the requested content if said peer node has access to the
requested content, and wherein said response message is formatted in
10 accordance with the resolver protocol.

86. A method comprising:

a peer node creating an advertisement for a peer group, wherein said
15 advertisement for the peer group comprises:

an identifier for the peer group;

a description of a common set of services to be instantiated within the peer
20 group by members of the peer group; and

a membership service advertisement indicating how others peers may
request to join the peer group; and

25 a peer node publishing, in accordance with a discovery protocol, at least a portion
of said advertisement for the peer group including said identifier and said
membership service advertisement.

87. The method as recited in claim 86, further comprising the peer node
30 instantiating a membership service, wherein said membership service implements a

membership protocol for joining the peer group such that any peer node may apply for membership in the peer group in accordance with the membership protocol.

88. The method as recited in claim 86, further comprising:

5

the peer node receiving an apply message from a potential new peer group member, wherein said apply message is formatted as defined by a membership protocol;

10

if the potential new peer group member is qualified to apply in accordance with a membership policy for the peer group, the peer node responding to said apply message with a first acknowledge message formatted as defined by said membership protocol, wherein the first acknowledge message comprises an application credential;

15

the peer node receiving a join message including the application credential from the potential new peer group member, wherein said join message is formatted as defined by said membership protocol; and

20

if the potential new peer group member is qualified to join in accordance with said membership policy for the peer group, the peer node responding to said join message with a second acknowledge message formatted as defined by said membership protocol, wherein the second acknowledge message comprises a membership credential identifying the peer as a member of the peer group and the peer group.

25

89. The method as recited in claim 86, further comprising:

30

the peer node receiving a message requesting said published portion of said advertisement for said peer group; and

the peer node sending a message in response to the request message including said published portion of said advertisement for said peer group;

5 wherein each message is formatted in accordance with the discovery protocol.

90. A method comprising:

10 a peer node in a peer-to-peer network initiating a peer group discovery query in accordance with a peer discovery protocol;

the peer node receiving a peer group advertisement for a peer group

15 the peer node joining said peer group in accordance with a membership protocol; and

20 the peer node sharing a common set of services with other peers in said peer group only, so that said peer group defines a limited domain of availability for said services.

91. The method as recited in claim 90, wherein said advertisement for the peer group comprises:

25 an identifier for said peer group;

a description of a common set of services to be instantiated within said peer group by members of said peer group; and

30 a membership service advertisement indicating how others peers may request to join said peer group;

92. The method as recited in claim 91, wherein the peer group implements a peer membership service that implements a membership policy for said peer group restricting which peer nodes are allowed to join said peer group.

5

93. The method as recited in claim 92, wherein said joining comprises:

the peer node sending an apply message to the membership service, wherein said apply message is formatted as defined by said membership protocol;

10

the peer node receiving a first acknowledge message formatted as defined by said membership protocol, wherein if the peer node is qualified to apply in accordance with the membership policy for said peer group, the first acknowledge message comprises an application credential;

15

the peer node sending a join message including the application credential to the membership service, wherein said join message is formatted as defined by said membership protocol; and

20

the peer node receiving a second acknowledge message formatted as defined by said membership protocol, from the membership service, wherein, if the peer node is qualified to join in accordance with the membership policy for said peer group, the second acknowledge message comprises a membership credential identifying the peer node as a member of the peer group and said peer group advertisement for said peer group describing the common set of services available to member peers of said peer group.

25

94. The method as recited in claim 91, further comprising:

30

the peer node receiving a message requesting advertisements comprising

descriptions of services offered by the peer node, wherein the request message is formatted in accordance with said discovery protocol; and

the peer node sending a message in response to the request message comprising one or more advertisements to services comprised in the peer node, wherein the response message is formatted in accordance with said discovery protocol.

95. The method as recited in claim 91, further comprising:

the peer node sending a message requesting advertisements comprising descriptions of services offered by other peer nodes, wherein the request message is formatted in accordance with said discovery protocol; and

the peer node receiving one or more messages comprising advertisements to services comprised in the other peer nodes in response to the request message, wherein the response message is formatted in accordance with said discovery protocol.

96. A carrier medium comprising program instructions, wherein the program instructions are computer-executable to implement:

forming a plurality of peer groups in a peer-to-peer network, wherein each peer group comprises a plurality of peers;

each peer group defining a common set of services available to member peers of the particular peer group; and

wherein member peers of each peer group share network services or content with other member peers of the particular peer group only, so that the particular

peer group defines a limited domain of availability for said network services or said content.

97. A carrier medium comprising program instructions, wherein the program
5 instructions are computer-executable to implement:

a peer node joining a peer group in accordance with a membership protocol;

10 upon joining said peer group, the peer node instantiating one or more of a
common set of services defined for said peer group; and

the peer node sharing a network service or content with other members of said
peer group only, so that said peer group defines a limited domain of
availability for said network service or said content.

15 98. A carrier medium comprising program instructions, wherein the program
instructions are computer-executable to implement:

20 a peer node creating an advertisement for a peer group, wherein said
advertisement for the peer group comprises:

an identifier for the peer group;

25 a description of a common set of services to be instantiated within the peer
group by members of the peer group; and

a membership service advertisement indicating how others peers may
request to join the peer group; and

a peer node publishing, in accordance with a discovery protocol, at least a portion of said advertisement for the peer group including said identifier and said membership service advertisement.

5 99. A carrier medium comprising program instructions, wherein the program instructions are computer-executable to implement:

a peer node in a peer-to-peer network initiating a peer group discovery query in accordance with a peer discovery protocol;

10

the peer node receiving a peer group advertisement for a peer group

the peer node joining said peer group in accordance with a membership protocol;
and

15

the peer node sharing a common set of services with other peers in said peer group only, so that said peer group defines a limited domain of availability for said services.